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ARMORED MEDICAL RESEARCH LABORATORY

FORT KNOX, KENTUCKY

INDEXED

First Partial Report

On

PROJECT NO. 24 - STUDY OF HEAD PROTECTION FOR TANK CREWS

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Project No. 24

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13 June 1945

ARMORED MEDICAL RESEARCH LABORATORY
Fort Knox, Kentucky

SPMEA 727-121
Project No. 24

13 June 1945

1. PROJECT: No. 24 - Study of Head Protection for Tank Crews, First Partial Report.

a. Authority: 9th Ind. 421.2(R), 12 Nov 43, GNRQT-6/69160, 1st Ind. OQMG-389, 15 Jan 45.

b. Purpose: To summarize development of helmets for tank crew members with particular reference to Quartermaster liner now being considered for adoption.

2. DISCUSSION:

a. A meeting was held at Armored Medical Research Laboratory, 6 May 1944, to consider a helmet to replace M1 helmet and liner and football-type helmet for tank crews' use. Members of AGF, OQMG, The Armored School, Armored Board and AMRL were present. It was decided that two lines of development should be followed: (1) Primary design of crash helmet with superimposed steel helmet, (2) Ballistic and crash protection combined in one unit. The Quartermaster liner now being considered is the result of development (1) above. Ordnance is preparing samples of steel helmet to fit over the Quartermaster liner. Ordnance is also preparing samples of combined helmet in accordance with development (2) above. Field tests have been run on the Quartermaster helmet and will be run on Ordnance helmets as soon as available. Inasmuch as the basic considerations for tank helmets are the same whether with integral or separate armor, the design problems will be considered together in Appendix A.

3. CONCLUSIONS:

a. The latest version of the Quartermaster tank helmet is considered satisfactory for crash protection provided the chin strap support is moved from the outside to the inside of the helmet.

b. The M1 steel helmet may be worn with the Quartermaster tank helmet by personnel outside the tank or when traveling with hatches open but is not satisfactory for use inside the tank.

c. Where armor protection inside the tank is required, a modified steel helmet to fit over the Quartermaster helmet or a unit steel helmet with suspension equal to the Quartermaster helmet will be required. Both of these type helmets are now in development by Ordnance.

d. The modified head rest recommended in AMRL Project No. 6-1, 6-2, 6-3, 6-4, 6-6 - Vision in Tanks -- Eye Cups, Head Rests, and Head Clearances, dated 6 September 1944, is required for periscopes and mounted spotting binoculars to be used by personnel wearing the Quartermaster tank helmet or Armored versions under development by Ordnance.

4. RECOMMENDATIONS:

a. That with the change in chin strap support from outside to inside, the latest version of the Quartermaster tank helmet be considered satisfactory for crash protection for tank crew use.

b. That standard M1 steel helmet worn over Quartermaster tank helmet be considered satisfactory only when worn outside the tank or with head out of open hatches and not satisfactory for use inside the tank.

c. That headrests of the type recommended in AMRL Project No. 6-1, 6-2, 6-3, 6-4, 6-6 - Vision in Tanks - Eye Cups, Head Rests, and Head Clearances, dated 6 September 1944, be procured and installed on periscopes in tanks for use with the Quartermaster tank helmet.

d. That Ordnance development of Armored steel helmet to fit over Quartermaster tank helmet be continued to provide armor protection which will be satisfactory for use inside the tank in addition to use with head outside open hatches or outside tank.

e. That present Ordnance development of one piece steel helmet be completed for comparative evaluation.

Submitted by:

Lt. Col. F. S. Brackett, SnC
Major Lester B. Roberts, SnC
Captain Wendell E. Mann, MAC

APPROVED BY

Willard Machle

WILLARD MACHLE
Colonel, Medical Corps
Commanding

2 Incl.

Appendix - Incl. #1

Ind. 1 thru 7 - Incl. #2

APPENDIX

Certain of the requirements of a tank helmet are clear: These are:

1. Crash protection.
2. Comfort.
3. Integration with other head apparel.
4. Integration with sights, periscopes, tank ceiling and gun recoil guard to afford reasonable clearances when performing duties in tanks.
5. Ballistic protection when head is outside tank.

These requirements, with the exception of 5, are reasonably well satisfied by the Quartermaster helmet liner under consideration. No. 5 can be satisfied, using the Quartermaster liner, only by providing an auxiliary steel helmet to fit over the Quartermaster liner. The steel helmet may be the standard M1 steel helmet or the modified M1 Ordnance steel helmet now being developed. The M1 steel helmet is not satisfactory inside the tank because it does not satisfy requirements 3 and 4. The Ordnance modification could be worn inside the tank since it is designed to meet requirements 3 and 4 above, so far as is possible.

If steel helmets are to be worn outside the tank and not inside, crew members will be required to remove the helmets each time they button up. More important, convenient stowage space for the steel helmets inside the tank will have to be found. Such stowage space is not now provided. Outside stowage is reported to be impractical.

As regards ballistic protection, the commander and driver are most concerned. The commander especially finds it necessary to have his head out of the turret much of the time. He does not have time to remove and stow the steel helmet when he is inside. He must then wear the steel helmet inside the tank at such times. The Quartermaster liner plus development Ordnance steel helmet or Ordnance development one-piece armored helmet would meet his requirements.

When Ordnance development helmets are completed and tested it will be possible to appraise some of the problems considered above and arrive at a doctrine of procedure for the tank crew members.

THE ARMORED BOARD, Fort Knox, Kentucky. 26 Jun 1945.

TO: Commanding Officer, Armored Medical Research Laboratory, Fort Knox, Kentucky.

1. The latest version of the Quartermaster tank helmet referred to in basic report appears to satisfy all the specifications listed in 2nd Indorsement, Headquarters, Army Ground Forces, file 421.2 GNRQT -6/21942, dated 24 April 1945, and 3rd Indorsement, Headquarters, Armored Center, file 420/1 GNREE, dated 1 May 1945, except that the built-in earphones are not present.

2. The Armored Board concurs in paragraph 4 of subject report, with the exception that the latest version of the Quartermaster tank helmet not be considered satisfactory until such time as it has been comparatively tested with:

- a. The one-piece steel helmet, and
- b. The tank helmet with built-in earphones.

/s/

V. O. Barnard

Lt. Col. FA

for

/t/

LOUIS V. HIGHTOWER

Colonel, Field Artillery

President

1 Incl.

n/c

SPMEA 727-121

2nd Ind

Armored Medical Research Laboratory, Fort Knox, Kentucky, 7 July 1945.

To: President, Armored Board, Fort Knox, Kentucky.

1. Reference is made to Armored Board Report No. 680, "Test of Tank Helmet T19E1", 9 April 1945, paragraph 4, item b. The helmet T19E1 recommended for adoption as an interim measure is the Quartermaster helmet referred to in AMRL report #24 - prior to modification along lines recommended by Armored Board.

2. Reference 3rd indorsement, 420/1 (31 March 45) GNREE, paragraph 2 b, unless the requirement for ballistic protection is to be reconsidered at this time there does not appear to be any point in delaying procurement of modified helmet T19E1, as per 1st indorsement this letter (Armored Board paragraph 2). As pointed out in appendix of AMRL report #24, a one-piece helmet with ballistic protection may offer an adequate solution but would

(2nd Ind., 7 July 1945, AMRL, to President, Armored Board, Ft. Knox, Ky.)

require reversal of decision previously made.

3. To our knowledge no helmet with built-in earphones is in development at present time. There is an immediate need for production of a crash helmet and subject helmet is believed to be the best now available.

1 Incl:
n/c

/s/ Willard Machle
/t/ WILLARD MACHLE
Colonel, MC
Commanding

THE ARMORED BOARD, Fort Knox, Kentucky. 26 Jul 1945.

To: Director, Armored Medical Research Laboratory, Fort Knox, Kentucky.

1. The Armored Board concurs with the opinion expressed in Paragraph 4 of 2nd Indorsement and recommends that the subject equipment be approved for production as limited standard..

2. The desirability of a tank helmet having built-in ballistic properties seems obvious, and the practicability of building such a helmet of lighter weight than the combination helmet and helmet liner seems apparent. The practical disadvantage of a two-piece helmet is apparent to all personnel who have been closely associated with tank combat. The disadvantage of stowing several steel helmets within a tank with all the consequent inconveniences to personnel and operations within a closely confined space, is exceeded only by the impracticability of attempting to require tank personnel to search for and put on their steel helmets every time they dismount. Combat experience indicates that something in the neighborhood of 50% of casualties to tankers occur while they are outside of tanks; the advantage of head protection at such times is agreed upon by all concerned. Any contention that tankers can be required uniformly to put on steel helmet shells before dismounting from a tank implies a lack of knowledge of battle behaviour; while men will do so in situations in which they feel themselves to be in danger, even veteran soldiers can not recognize potentially dangerous situations with a sufficiently high degree of consistency, and inexperienced troops always "learn the hard way".

3. The development of a satisfactory tank helmet, including ballistic protection, is a typical equipment problem involving a decision whether to

(1) Adopt a piece of equipment ill-adapted to use with equipment with which it is intended to be used, i.e., the tank, the use of which requires additional disciplinary training and assumes, fallaciously, a state of discipline which never exists on the battle field or,

(2) To insist upon the development of equipment that fits the needs of the soldier, the limitations of his vehicle and his behaviour characteristics when in combat.

/s/ Louis V. Hightower

/t/ LOUIS V. HIGHTOWER
Colonel, Field Artillery
President

1 Incl: n/c

Armored Medical Research Laboratory, Fort Knox, Kentucky, 14 August 1945

To: President, Armored Board, Fort Knox, Kentucky, 22 Aug 1945.

1. Reference is made to par 2 and 3 of Armored Board 3rd Indorsement. The Armored Medical Research Laboratory concurs with the reasoning and basic combat logic applied and has expressed the difficulties in different form in the body and appendix of the basic report.

2. As regards need for ballistic protection, both the Armored Board and the Armored Medical Research Laboratory views appear to be in disagreement with AGF report of requirements in Europe (see par d, 2nd Indorsement 421.2, 31 Mar 45, GNRQT-6/21942 and par 2-b, Headquarters Armored Center, 3rd Indorsement, 420/1, 31 Mar 45, GNREE). Clearly what is needed is a full concise statement of requirements and a firm decision for future helmet consideration.

3. In view of the agreement for approval on limited standard basis it is suggested that basic report be sent on its way and action be taken by all interested parties to get together and iron out difficulties outlined in par 2 above.

/s/ Willard Machle
/t/ WILLARD MACHLE
Colonel, MC
Commanding

421 GNOFB

5th Ind.

JWS/wmt

THE ARMORED BOARD, Fort Knox, Kentucky.

To: Commanding Officer, Armored Medical Research Laboratory, Fort Knox, Kentucky.

The Armored Board concurs in the recommendation set forth in paragraphs 3, 4th Indorsement.

/s/ Louis V. Hightower
/t/ LOUIS V. HIGHTOWER
Colonel, Field Artillery
President

1 Incl: n/e

ARMORED MEDICAL RESEARCH LABORATORY, Fort Knox, Kentucky, 10 September 1945

TO: Commanding General, Headquarters, Armored Center, Fort Knox, Ky.

Transmitted herewith for recommendation and/or concurrence one (1) copy of Project No. 24 - Study of Head Protection for Tank Crews - dated 13 June 1945.

FOR THE COMMANDING OFFICER:

/s/ Charles E. Stickler
/t/ CHARLES E. STICKLER
2nd Lt., MAC
Adjutant

1 Incl: n/c

319.1 (18 Jun 45) GNREE 7th Ind.

HQ ARMD CENTER, Fort Knox, Ky, 13 Sep 1945

TO: Dir, Armd MRL, Fort Knox, Ky

1. This headquarters concurs in the recommendations of paragraph 3, 4th indorsement.

2. It is apparent in digesting the contents of the preceding indorsements, that a clearly defined statement of characteristics is essential before further research is undertaken.

FOR THE COMMANDING GENERAL:

/s/ R. F. Rickard
/t/ R. F. RICKARD
Lt. Col., A. G. D.,
Adjutant General.

1 Incl: n/c

